2019 Pivot Academy Evaluation Report

Figure 1:Kigoma Secondary school students

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Introduction

This document reports on the evaluations of Pivot Academy schools during Spring 2019. Each of the five schools have participated in the Pivot Academy teacher training and student learning program in a period of one year. This report seeks to identify the impacts and gaps left by the program.

Murama Secondary

Classes Observed

Biology Class Senior 5 (Teacher 1) - Protein Synthesis, genetic code (amino Acids) - internet searches
Chemistry Class Senior 2 (Teacher 2) - PH paper acid vs base - PhET offline simulation used to see how PH paper works

Figure 2: Murama Secondary School O'level students using PHET for offline simulation used to see how PH paper works

Infrastructure

The school has the ICT technician
Teachers use tablets in the computer lab for internet access
Groups of students per laptop compared to tablets
1:1 Laptops
3:1 Tablets
Students use tablets in the computer lab as well
Technician delivered tablets to class and observed but didn't help students use them /resolve issues such as Wi-Fi which was the major one at the moment

Education

Teacher pedagogy:

- Teacher had many knowledge based questions where students would look up definitions and lists of items on the tablets
- Teacher attempted a comprehension questions for classification, but google gave too good of an answer making the questions more knowledge and identification based
- Teacher gave one synthesis question asking students to develop their own hypotheses about why proteins have three vs two components. Students formulated answers by thinking critically about their past work
- The teacher was not moving around to check what the students are getting from the tablets, hence the teacher ignored the group of students who had the internet challenge with their tablet.
- The teacher had students recognize the similarities between definitions and then distinguish them to come up with the best solution
- Teacher 2: used offline PhET simulation for students to explore PH paper
- Teacher 2: moved around the classroom to circulate and see how students were doing
- Tablets used for 20 minutes out of class time, which was 80 minutes
- Teacher would tell students to turn off tablets, but not follow-up

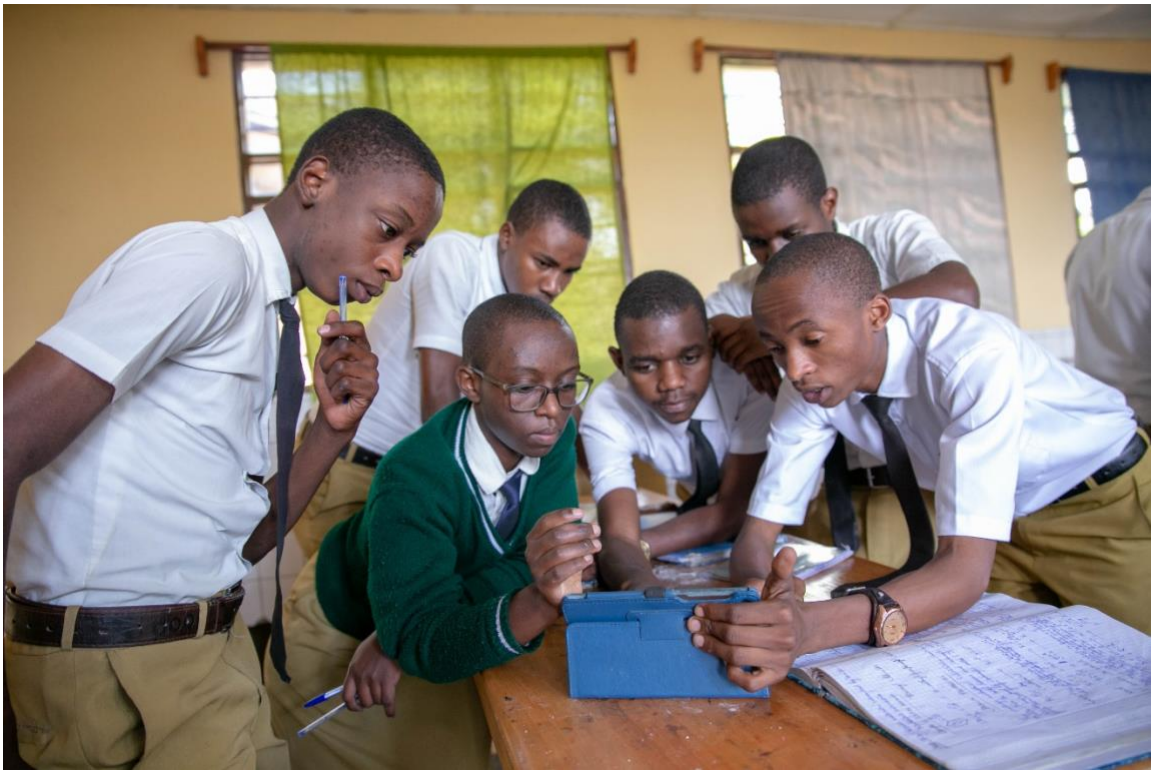

Figure 3: Murama Secondary School Students doing research about Protein Codes

Student learning style:

- Students worked in groups of 3-4
- Tablet stayed in the center of the group physically
- Students would take turns helping to navigate on the tablet
- Students would take notes on what they found
- For students without working tablets (no Wi-Fi), they went to another group or withdrew from actively participating in class

    - They would take notes, but not answer questions b/c they couldn't look for answers
- Students used tablets to write definitions on the chalkboard
- In groups, when one of the group members was doing the research the rest of the team was taking notes in their notebooks.
- Class 2: Students worked in groups exploring the simulation and testing out the acidity of different compounds
- Fewer students were using the tablets for selfies and off-task behavior indicating a familiarity with computing devices

Project Management

- 3 cracked screens, 3 tablets locked, 4 with tags removed
    - Indicating that the school took care of the tablets as a whole
    - The cracks were made by non-teaching admins who took the tablets out of cases or removed id tags
- Teachers used tablets daily, maybe bi-weekly for educational use
- Tablets kept boxed up in the ICT room when not in use
- No check-in / check-out for the tablets (could be useful moving forward)
- Teachers made an effort to have students find out information on their own (albeit not perfect)

Figure 4: MAC staff with Murama Secondary School teachers discussing and evaluating Pivot Academy

Sustainability Outlook

- Inventory for tablet use
- Getting the tablets back into the hands of teachers and students
- Troubleshooting guide and manual
- Want more offline apps, for home prep
- Teachers needs tablets/enough memory to keep the all the materials/resources in one tablet

Kigoma Secondary

Classes Observed

Physics Senior 6 - use of physics in telecommunications
Physics Senior 1 - Newtonian mechanics - Force, Friction

Figure 5: Kigoma Secondary School Students doing research on the use Physics in Telecommunication

Infrastructure

- No ICT Technician, but they have the Computer Science teacher
- Tablets were used in regular classrooms; not in lab w/ internet
    - Teachers would send students to internet for "research"
- Tablets probably kept in the office of the dean of studies
- Many tablets taken out of their cases
- No inventory system for tablets, tablets did have numbers
- S4 students wipe tablets each night, no persistent data/images

Education

Teacher Pedagogy:

- Teacher introduced the class to the researchers, and also told researchers what class was about
- Teacher gives students time during the morning to research their topics, then they present in class ~1-2 hours later
- Teacher would interrupt student presentations to have students give more canned responses to tell why tablets are important to the school and classroom (not centered around learning goals)

- Teacher 2 introduced the topic to the class,
- Had students determine speed, and then formulate ideas about what is force
- Teacher 2 only had 1 tablet; organized classroom into groups of ~6
- Teacher 2 walked around frequently to each group to show a simulation about force
    - Encouraged students to define force and collaborate with peers to come to agreement
- Once Force was agreed upon, teacher related the topic to real life examples
- Teacher 2 did the same routine for Friction force and Contact force

Figure 6: Kigoma Secondary School senior 1 students doing research about the definition and meaning of force

Student Learning Styles:

- Students worked in groups of 3-4
- During the presentation, students referred to their notes
    - Students did a quick demo with tablet on Pitch measurements
    - Students were interrupted with teacher input
    - Other students were just sitting around, perhaps discussing
        - Some using calculator and other apps to do work
- Students took selfies/did off task behaviors
    - Indicating lack of familiarity with tablets
    - Students also indicated more tablets = ability to send emails (misunderstanding)
- Students claimed loss of information since tablets are shared
- Students said some of their apps were deleted and can't be used anymore (low space)

- Students collaborated with their group and synthesized the meaning of physics terminology to develop an understanding of the definitions
- Students would check their ideas with the teacher; requesting to see the simulation again, if they were struggling

Project Management

- 10 Tablets were Locked; 2 broken screen; 1 with charging issue
- Students get to use tablets during break
- Computer Science not allowed to use tablets for mobile app development because they already "have computers"
- Administrators also took some tablets and used for non-academia

Figure 7: MAC Staff with Kigoma Secondary school teachers discussing and evaluating Pivot Academy

Sustainability Outlook

- They want more storage -> look into local server for GB intensive apps/videos
- Have a teacher in charge of tablet use instead of administrative offices
- Enable Computer Science (CS) teacher to enhance teaching with mobile app development
    - **CS students can develop simulations for other teachers**
- Teachers needs more training in ICT and internet research\
- Teachers needs tablets/enough memory to keep the all the materials/resources in one tablet

Ruhango Secondary

Figure 8: MAC staff with Ruhango Secondary school Pivot Academy Teachers

Students in exams - no class observations

Infrastructure

- Lead teachers try to solve tech problems on their own
- No ICT teacher/tech person
- School has consistent power (can maintain refrigerator)

Education

Teacher Pedagogy:

- Tablet Review:
    - Youtube, calculator used daily (80% educational videos)
    - Weekly use of Anatomy/science apps
    - Downloaded space conscious versions of google apps (Google Go)
    - Youtube videos used to also show conceptual ideas (pop growth, systems, etc)
    - Tablets have been set up for quick access to frequently used apps
- Teachers like to use tablets because they load quicker than laptops for "research"
- The teachers are eager to learn more apps that can improve their students' learning.
    - They want to know the new apps that other schools are using to update themselves.
- Teachers believe students gain digital literacy, even if they are taking selfies
    - Piano App can be used to relax students after a long day
- Teacher intentionally rotates who is in the center of tablet sharing

Figure 9: Ruhango Secondary School Teachers with Jackson reminding them how to navigate schoology

Student Learning Styles:

- Students use downloaded books from the Rwanda Education Board (REB)
- Learning using tablets increase the students' engagement which reduces the number of distraction during class
- Some of the students still struggle with using the tablets since they do not get enough time to interact with them and they are few.
- Teachers note: Students focus better with tablets than laptops
- As students only get to use tablets in class, they still display naive uses such as camera/videos

Project Management

- Tablets are locked up between classes, not available for students or S1-3 teachers
- Pascal posts regularly and often to the Schoology groups; get little return
- Tablets stored w/ dean of academics
- All charging stations still present w/ cords; no tablets had issues they are well kept.

Figure 10: Ruhango Secondary School teachers with MAC discussing and evaluating Pivot Academy

Sustainability Outlook

- Teachers downloaded new curriculum textbooks from REB before they were released/delivered to schools
    - Teachers were able to prepare students with the new curriculum
    - Students scored highest in the district on exam scores because the teachers downloaded the questionnaires from other international schools that were already using the new curriculum
    - REB ration ~1 textbook per school, teachers didn't need to 'share'
- Teachers want to collaborate with other Byimana schools on Schoology
- Teachers wants tablets w/ sim cards so they can prepare at home
- Teachers want to train S1-3 teachers and let students borrow tablets during break (1 per grade band)
- Teachers want projectors for tablets, (screen casting, docucam)
- Teachers open to video conferencing

Figure 11: MAC staff with Ruhango district officer in charge of NGO partners

GSNDL Byimana Secondary

Classes Observed

Senior 6 - Math, Graphing exponential functions

Figure 12: Byimana Girls in their group working on the exponential function Activity

Infrastructure

- The school has the ICT teacher that acts as tech assistant
- Classroom setup had projector and docucam to share tablet screens with the class
- All electronics were on backup power sources; students use to "no power" beeps
- Extra backup batteries on classroom shelf for ICT person to set up
- List of tablet instructions for teachers [minor inventory system, #check]
- Have new 'smart classroom' laptop in each desk, Wi-Fi available
    - @ToDo - get Rwandan def. of smart classroom
    - Classroom windows have mirrors to reflect heat/light

Education

Teacher Pedagogy:

- Tablet Check
    - Teachers use videos to show abstract concepts in class (planetary motion)
    - Tablets save time instead of bringing to smart classroom
    - Multiple math apps (8+), A levels, mechanical demos, Org Chem
    - No social messaging apps - lack of Wi-Fi across school encourages teachers to use smartphones for personal use (sim card)

- Teachers regularly use educational apps, have also downloaded REB textbooks for student use
- Teacher needs ICT support for technology; projector not connected to computer; skewed projection, poor focus (fuzzy)
- Teacher draws app icon on the chalkboard (geogebra) to let students know what to look for
- Teacher has students work in groups 4-6 per tablet. For each differing answer across groups, a group representative shows their work/tablet on the docucam
    - Starts with students w/ misconceptions
- Teacher gives groups a worksheet with graphs and equations. Students use geogebra to match graphs and equations
- Teacher uses laptop in class with the same app installed, also shows worksheet on docucam
- Teacher verifies equations on chalkboard (small to see on projector)
- Circulates around the classroom tries to see each group. Class format blocks from reaching group in the back
- Teacher actively checks-in on students to see if tablets were working

Figure 13: Byimana Girls

Student Learning Styles:

- Student uses chalkboard to explain how they entered in the equation on the tablet
- Students verify plots/answers using scientific calculator
- Students not bothered at all by power outage alerts (tablets not effected)
- Students vocal when working in groups (active collaboration)
- Students with hesitation to share were asked, is tablet broken what is the situation? Gave students an out, confidence builder [students graphed 2nd eq.]
- Excited to learn more about ICT after having tablet experience (apps, web dev)
    - Initial naive shock/exploration -> deeper learning
- Review & do research on tablets, discover things teachers haven't found yet

Project Management

- 4 tablets not working; 3 not charging, 1 password locked
- 14 working student tablets, 6 teacher tablets
- Math uses some Schoology, others forgot username/password

Figure 14: MAC staff and Byimana girls teachers discussing and evaluating pivot academy in the smart classroom

Sustainability Outlook

- Recommend against chromebook as tablets used primarily for apps & e-books. Most schools have laptops available already
- Teachers want all teachers to have tablets for lesson prep
- [schoology] Some of the materials aren't suited for Rwanda schools (told to rate)
- Teachers want more practical activities on Schoology
- 3 year dream -> make lessons, during lessons, assessment; easier, quicker, important students learning.
- Setup local area network for video/book storage (Wi-Fi, but no internet)

Figure 15: Byimana girls using docucam, tablet, and the project for presentation

Retrospective (2016 pilot pioneers (S5) now in college):

Figure 16: Byimana Girls "OGs" now in college

Discussion notes:

- Yvette - chose software engineering as college degree
    - Pivot helped solve problems of effective communication
    - Wanted skills to develop more apps and websites
    - Exposure to CS and PBL led her to choose SWE as faculty
    - Most of her teammates are no longer interested in pivot/design cycle
        - Perhaps got involved with other activities afterwards
        - Mandatory choice to do STEM in school, left and had free will to do else
        - [if we go back, what can we do better]
            - Content was enough, problem was that school pushed it too hard (fear of punishment, demerits)
            - Tell admin that only students who were interested to participate could [incentivize, make exclusive]
    - Project: app to help schools communicate w/ each other; things in the future will show the impact of tech in solving problems of the future
    - Used to see problems as burdens; but now an opportunity for change

- Benita - when she got to Kepler, other students came to her for advice/help
    - She already gained these skills in Pivot
    - Self-described master in design cycle and research skills -> Improved self-efficacy and confidence
    - Had to develop teamwork and collaboration skills
    - 2 Friend from Byimana team is in ICT, Self is in ICT electives want to finish out project
    - Want to complete their Pivot project themselves; learn how to do ICT and not pay others
    - A friend created a coding club so we can get more young students involved in coding. Show them the opportunities of the career path and what they can do to foster their interests
- Pascaline - not so much - dabbles in cloud computing
    - Chose business management, does not see much relation to ICT or design cycle
    - Hoping that pivot will contribute in the future
    - Advice to younger sisters - Do it because you want to; look beyond the short benefit, it will help benefit in the future
    -
- Alexandra - also in college, business administration
    - Pivot has helped a lot; I can help make projects, do design cycle
    - Frequently asked by friends: how can I identify problems, devise solutions? How can I learn?
    - Team is still going to implement the project in the future once their done learning the skills they need.

- If you were to help redesign Pivot what would you change?
    - Add a showcase for parents and community members to see what the students have been doing and why it is important
    - Involving teachers from all levels would be good b/c they need those skills too
    - Teachers give an assignment, but there aren't enough books in the library
        - For o level students, outdated machines, had to beg permission to use other lab, sometimes denied.
        - For A' level students, the lab was the nicest and could be used
        - Giving students tablets it helped them make research
            - They are still young, won't be able to handle a full week w/o studying, classes
            - Will be there because they are happy to not be in class
            - Not mature enough - for fun and not learning
            - Lack time management and discipline to make reputable projects
    - Alexandra - maybe we could include high performing lower level students
        - Headmistress can identify good students
    - [Would you do tablets in O level, but not academy part]
        - Yvette - challenges of social media
        - Teachers can give students 10 minutes to do research, then come back and present (students can spend time doing both)
    - [should we focus only on that one week]
        - Follow-ups are important for further learning, but only with those that want to continue
        - Extra stage of collecting and continuing
    - Competitions were so motivating especially over holidays
        - Motivating to students to be outstanding
    - Jackson - It was even harder to do follow-ups in S6 because everything is focused on the national exams

        - We refocused to start with S4; Yr1 Design Cycle; Simple service problems w/in school; S5 - apply the science knowledge; S6 - think how it will be applicable and implemented outside of high school
        - [thoughts] Yvette - good to start w/ s4 b/c they need follow-up
            - Can't make assumptions, but perhaps you can use data to compare groups [brilliant use of design cycle]
        - Benita - Would it be waterfall phases or one cohort all the way through? [waterfall]
            - Students will get tired with the same thing the whole time, new years, new activities
    - What did you want to learn that wasn't part of the training?
        - Pascaline - ICT students wanted to do real problems, what we were shown didn't impress us. (exams + visa issues)
        - We need to include things that are matched to the discipline
        - Yvette - How to choose a partner (done by sparks & fires) but they weren't interested in the program, only came because mandatory
        - Benita - if you pick those by interest level, that might be alleviated

- **Challenges**
    - Benita, teams weren't organized by location, so meeting up is difficult
        - Especially with rural students
        - You should host coaching training in the countryside
    - [was group coaching/training important] ALL - yes, if wasn't important we wouldn't be coming
    - post high school follow-ups should happen where you can reach everyone who was selected
    - Some parents didn't understand. Why were they always visiting boys? Parents were concerned
    - **[Why did students stop?]**
    - STEM school doesn't value things that aren't academics
        - Too focused on learning to want to learn experimental things
        - Don't believe it's useful without evidence
        - Told by Byimana STEM student, our approach is like entrepreneurship, it doesn't quickly connect with science students
    - All - it's not like that, it applies to both. Those others don't like the openness
    - Yvette - it's different than Entr. b/c it was more practical than what our teachers was telling us.
        - Teacher comes, explains what he's doing, then we're assessed on it, little connection to real-life
        - At first when you were teaching we felt we already knew it, once we had to apply it though, we realized we were missing it (agreed by All)
- Wrap-up
    - Students want to continue with projects, we want to be able to help when they get close to implementation

Byimana STEM School Secondary

Classes Observed

Senior 5 - PCB; light refraction

Figure 17: MAC and Byimana school of science teachers discussing and evaluating Pivot Academy

Infrastructure

- 20 computers, ~8 laptops available in library for student use
- Students can checkout tablets
- Reading and motivational quotes around; very formal; golden rule "right place, right time, right person"
- Have local server to host videos; haven't downloaded books yet
- Want more tablets for efficient use; 4-5 tablets in Wi-Fi range
- Space for shared projector in ⅓ chalkboard

Education

Teacher Pedagogy:

- Teachers take tablets home for prep
- Students benefit from deeper understanding; learning; & listening
    - Reducing the abstract; self-guidance & exploration; familiarity w/ accents
- Not enough resources in science lab; tablets help simulate
    - Can combine chemicals w/o danger; (fire, toxins)
- Will download resources on their tablet, walk around class to show students
- Tablet investigation - mostly game apps; teachers use primarily search & YouTube w/ students; has download saved searches for later (google functionality)
- Teacher reviews topic on chalkboard; gives complete the table activity
- Teacher has students move to calculators if tablets aren't working (loss of power)
- Assistant teachers help students (just for us) - + tech difficulties

Figure 18: Byimana School of science teachers with MAC staff

Student Learning Styles:

- Groups for using tables are 3: 1 classroom use
- Students use tablets to calculate refraction angles using Phet
- Driver, navigator, scribe - all students agree before scribe writes down info
- Tablet stays central - teacher calls out students if tablet is pulled to side
- Students identify a pattern to derive equation for refractions
- Loud group conversations & group discussions (academic focused)

Project Management

- Tablets used in mathematics club, also available for checkout from library
- Inventory system to bring tablets back to front of classroom (# check)

Sustainability Outlook

- Want 1:1 tablets (50-100 per school)

Overall Recommendations

In the sustainability outlook for each of the school there some recommendations moving forward as well as the challenges. some of the challenges were addresses while we were at each school, such the navigation of some of the apps (Kahoot, google play, and Schoology) and unlocking the tablets. However, most of the common recommendations were:

- More ICT and using tablets for the teachers
- Adding more tablets for the efficient students' use
- Having more memory for the tablets which we thought each school to have a local server
- Active participation of the teachers on Schoology both Rwandan teacher and the US teachers
- Having a manual of how to fix tablets on their own especially on the issues that were fixed during the trip. This manual is being created and ready to be posted on Schoology.